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EDITORIAL

Lessons from a century of evidence-based fire management in grassy ecosystems

Introduction

Since prehistory, fire has been influential as an ecosystem process and has been used by people as a tool to support livelihoods and maintain landscapes worldwide. This is especially true in grassy ecosystems, where landscapes and ecological systems are fire-adapted and fire-dependent and where, even today, people are reliant on fire to manage resources (e.g. grazing areas and important food plants). Currently, global attitudes towards fire and the use thereof are shaped by the impacts of fire in forests, resulting in flawed negative perspectives of the impacts and role of fire in grasslands.

The environment in which we manage fire is also changing, climatically, politically, socially, and economically, at scales ranging from local to regional to global, with the potential to alter essential fire regimes that support biodiversity, ecosystem services, and people's livelihoods. Understanding and managing fire to support both the social and ecological dynamics presents a formidable challenge.

In Southern Africa, the first formal scientific investigations of fire started in the early 1900s. Although learning was common practice among traditional land managers, prevailing perceptions of fire in grassy ecosystems among European colonists and scientists were negative. Ecologists from this era (e.g. John William Bews and John FV Philips) questioned prevailing negative attitudes, calling for more empirical and experimental investigations into fire impacts and behaviour. These efforts helped grow generations of fire ecologists, foster interactions among scientists, managers, and local communities, and raised important questions about whether the scientific approach complements or undermines indigenous knowledge and practices. One hundred years after the first scientific studies on fire impacts in southern Africa were published, it is time to both celebrate and critically assess our current understanding and progress.

Information from fire experiments offer a strong foundation for evidence-based fire management, with increasing emphasis on incorporating indigenous and traditional fire management practices that have been shown to reduce fire risk and carbon emissions and increase fire safety, while also promoting fire-dependent ecosystem processes and services. In this Special Issue, we include diverse perspectives that examine the evidence from ecological and social disciplines on fire management in grassy ecosystems across the world. More than a century of fire experiments and applied fire management and suppression, together with modern technological advances in fire detection, mappings and monitoring, offer a strong foundation for evidence-based fire management.

Contents

This African Journal of Range and Forage Science, Fire Special Issue is dedicated to Winston Smuts Watts Trollope for his contribution, commitment, inspiration, support and a lifetime of work to Fire Ecology, with a tribute compiled by Navashni Govender, Sally Archibald, Susanne Vetter and Corli Wigley-Coetsee.

Brian W van Wilgen wrote a succinct yet thorough review of the book titled 'Ecology of fire-dependent ecosystems: Wildland fire science, policy and management', by Devan McGranahan and Carissa Wonkka. Although the authors are from North America and the focus is accordingly skewed towards the northern hemisphere, many good examples are used from around the globe, including Africa, to introduce all aspects of wildland fire science.Van Wilgen's review highlights how fire use, and fire research in Africa has contributed to the global understanding of the interplay between science, policy and management, and this sets the scene for the papers presented in this special issue.

What the papers report on

Pooley et al. (2022) provide a historical overview of using fire science (usually through experiments and data analysis) and expertise to implement fire management strategies within savanna and grasslands of Southern Africa. The paper recognises that the local and indigenous uses of fires have largely been left out of the debate and calls for more incorporation of traditional burning practices. Four papers report on the effects of fire on the herbaceous layer (Bombo et al. 2022; Dabengwa et al. 2022; Findlay et al. 2022; Meller et al. 2022), all of which show that how fires were applied (varying seasons, frequencies and intensities) was crucial for improving grass functionality, lending support to the idea that pyrodiversity is required for maintaining and increasing herbaceous diversity. The importance of understanding the interaction between fire and other disturbances, such as herbivory (Bombo et al. 2022) and frost (Meller et al. 2022), for healthy grassy ecosystems is also emphasised. Contrary to expectations, Findlay et al. (2022) demonstrated that Afromontane grassland soils continue to sequester carbon with fire and that sequestration is greater in the presence of fire than in its absence.

Most research can only infer short-term effects, and it is only when long-term experiments are available that much longer observations can be made for more robust conclusions. Palaeoecological work by Dabengwa et al. (2022) and Hamilton et al. (2022) provide the long-term context for the role prehistoric fire had in shaping Africa's

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grassy biomes, with the aim of engaging the diverse stakeholders that have to manage Africa's grasslands. Fire is a key driver in maintaining the tree-grass balance and together with its interaction with rainfall (Hamilton et al. 2022), carbon dioxide (Raubenheimer et al. 2022), and land use (Humphrey et al. 2022), helps us understand the loss of grassland, as a result of woody encroachment into our grassy ecosystems under changing climatic conditions. Fire and humans have always been intertwined, and how humans influence and use fire is sometimes misunderstood. In Africa, humans are an integral part of fire management and anthropogenic fires are a crucial component contributing to livelihoods on the continent. Puttick et al. (2022) and Wood et al. (2022) outline the anthropogenic effect on fire regimes to achieve desired outcomes, such as reducing woody encroachment. However, the perception of fire and its benefits is largely influenced by mass media and public opinion rather than real information. Smit et al. (2022) demonstrates the important role that scientists have in influencing media framing and perceptions of fire events, potentially changing predominantly negative perceptions to a more positive outlook on fires, their use, and benefits. Research and experimentation ultimately increase our knowledge and improves our understanding with the aim to support management decisions for better fire implementation to achieve desired outcomes. Therefore, whether one actively burns to manage bush encroachment (Scholtz et al. 2022) or to reduce 'savannisation' (Cassidy et al. 2022), or opt to maintain a laissez-faire policy (Stalmans et al. 2022), fire is a necessary management tool available to managers.

The research presented in this Fire Special Issue contributes towards improving understanding, implementation, and use of fire as one of the key tools that managers have at their disposal to promote biodiversity and manage grassy landscapes. Fire, either from lightning or humans, have and will be with us for a long time. However, fire frequency, season, intensity, and dominant ignition sources are changing. Therefore, if we manage these fire changes to set, address, and achieve our biodiversity outcomes, the use of fire as a management tool may be increasingly acceptable by all.

Fire is an emotive subject, inspiring strong opinions (Smit et al. 2022) and we encourage ongoing research and communication to continuously improve understanding, experience, and outreach on the use of fire for effective, efficient, and safe burning practices in an ever-changing world, thereby ensuring that fire is more friend than foe.

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